BioChambers
PROVIDING GROWTH TO RESEARCH.

Condensers

Guidelines on Choosing the Correct Type for Your Application.

Introduction

Plant growth chambers provide researchers with a tremendous amount of control of environmental parameters, including temperature, humidity, CO_2 levels, and more. To maintain their set temperature, most plant growth chambers have a dedicated refrigeration system to remove heat from the chamber and accurately maintain the required temperature. Heat inside the chamber is generated from various sources including the lamps, circulating fans, fresh air, and more.

Heat is removed from the chamber by circulating the air inside the chamber over a heat transfer coil, commonly called an evaporator. As air passes over the evaporator the heat is transferred from the air into a fluid that passes through the tubes of the evaporator. This fluid (or refrigerant, sometimes called Freon®) then carries the heat from the evaporator to a location outside the chamber.

Once the refrigerant has made its way outside the chamber the heat must be removed before it can continue back to evaporator to absorb more heat from the chamber. The component responsible for cooling the refrigerant outside the chamber is called the condenser.

There are several types of condensers available and choosing the correct type for your application is an important factor when purchasing and installing a plant growth chamber. This depends on the amount of space available in the facility and the utilities available in the area of the chamber installation.

For perspective, the size of an air conditioning unit required for a standard plant growth chamber is comparable to the size of an A/C unit required for a 1500 ft^2 house.

Remote Air-Cooled Condenser (RACC)

Water-Cooled Condensers

Water-cooled condensers are the most common choice where a source of cooling water is readily available. If available this is also the simplest solution since the infrastructure is already in place and connection to the chamber is usually a fairly straight forward and inexpensive process. It is important to verify that the cooling water is available in the location you wish to place your plant growth chamber, and that the cooling water system can handle the extra heat from the chamber.

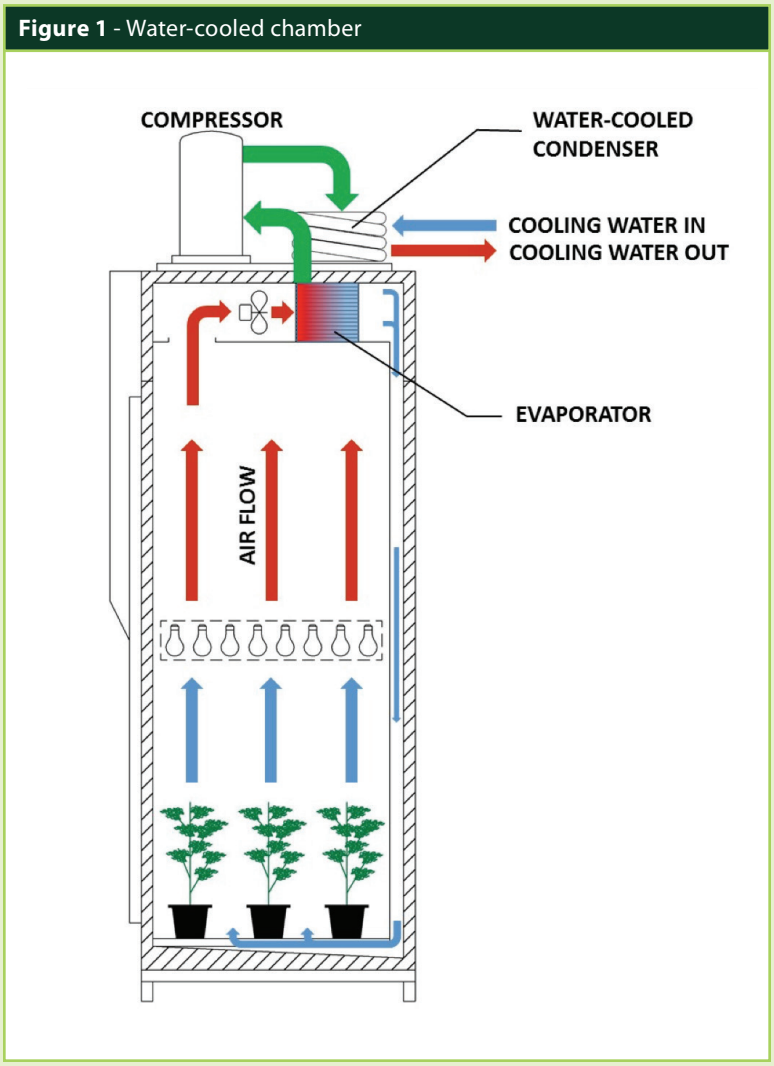
Benefits

- Condenser is small and compact and can usually be located within the plant growth chamber itself, reducing the overall space required in the lab.
- Condenser is less expensive compared to air-cooled options.

Drawbacks

- A cooling water supply with adequate capacity must be available, either currently installed or planned in building renovations, prior to equipment commissioning.
- The plant growth chamber is dependent on a separate system for operation. If the cooling water supply fails, the chamber will shut down.

Figure 1 - Water-cooled chamber



Self-Contained Air-Cooled Condensers (SCACC)

If cooling water is not available in the facility, the refrigerant in the chamber system is usually cooled by air. This type of condenser looks much like a car radiator, with fans to move air over the coil.

For larger plant growth chambers this type of condenser is located outdoors because of its size and the amount of heat released from the condenser. However, for small chambers this condenser can be located on the plant growth chamber itself. This makes installation of the plant growth chamber simple as no additional piping or electrical wiring is required for the condenser. However, in this case the heat from the plant growth chamber is released to the air in the laboratory and must be removed by the building HVAC system.

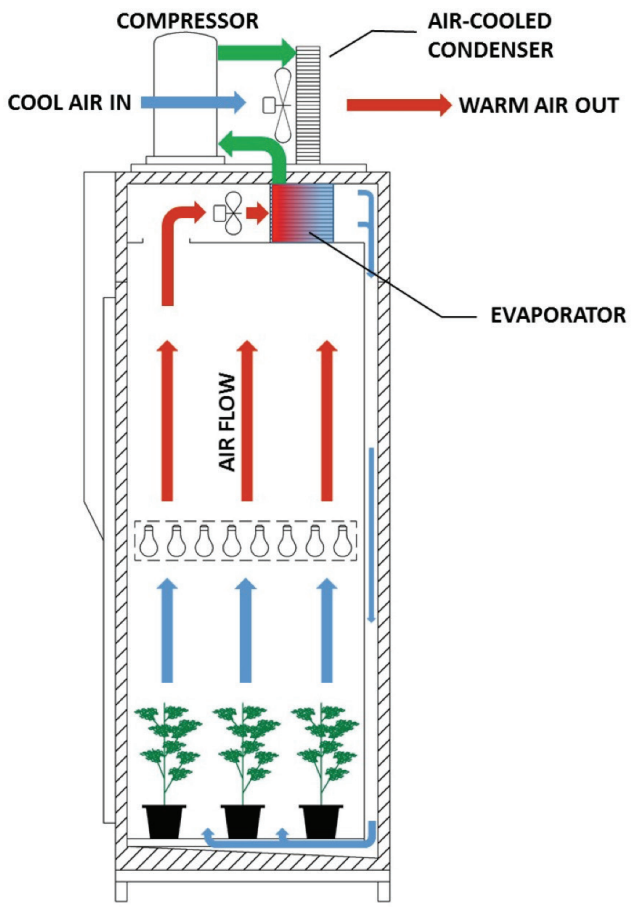
Benefits

- No cooling water supply is needed.
- No additional plumbing is needed, resulting in easy installation.
- Condenser is small and compact (usually located on the plant growth chamber itself) reducing the chamber footprint and simplifying installation.

Drawbacks

- Option is limited to small plant growth chambers.
- Heat from the chamber must be removed from the laboratory.
- Small amount of additional noise from the condenser fan.

Figure 2 - Self-contained air-cooled chamber



Remote Air-Cooled Condensers (RACC)

For larger plant growth chambers which do not have access to cooling water and for which self-contained air-cooled condensers become too large for indoor installation and release too much heat for building HVAC systems, larger outdoor condensers must be used. A suitable location near to the plant growth chamber must be available. Often this is at ground level or on the building roof. The condenser must have a suitable footing to ensure stability, such as a solid concrete base, and adequate space around the unit to accommodate required airflow. Refrigeration pipes must be run to join the condenser to the chamber. The condenser must also be supplied power, either directly from the plant growth chamber or from a separate power source nearby.

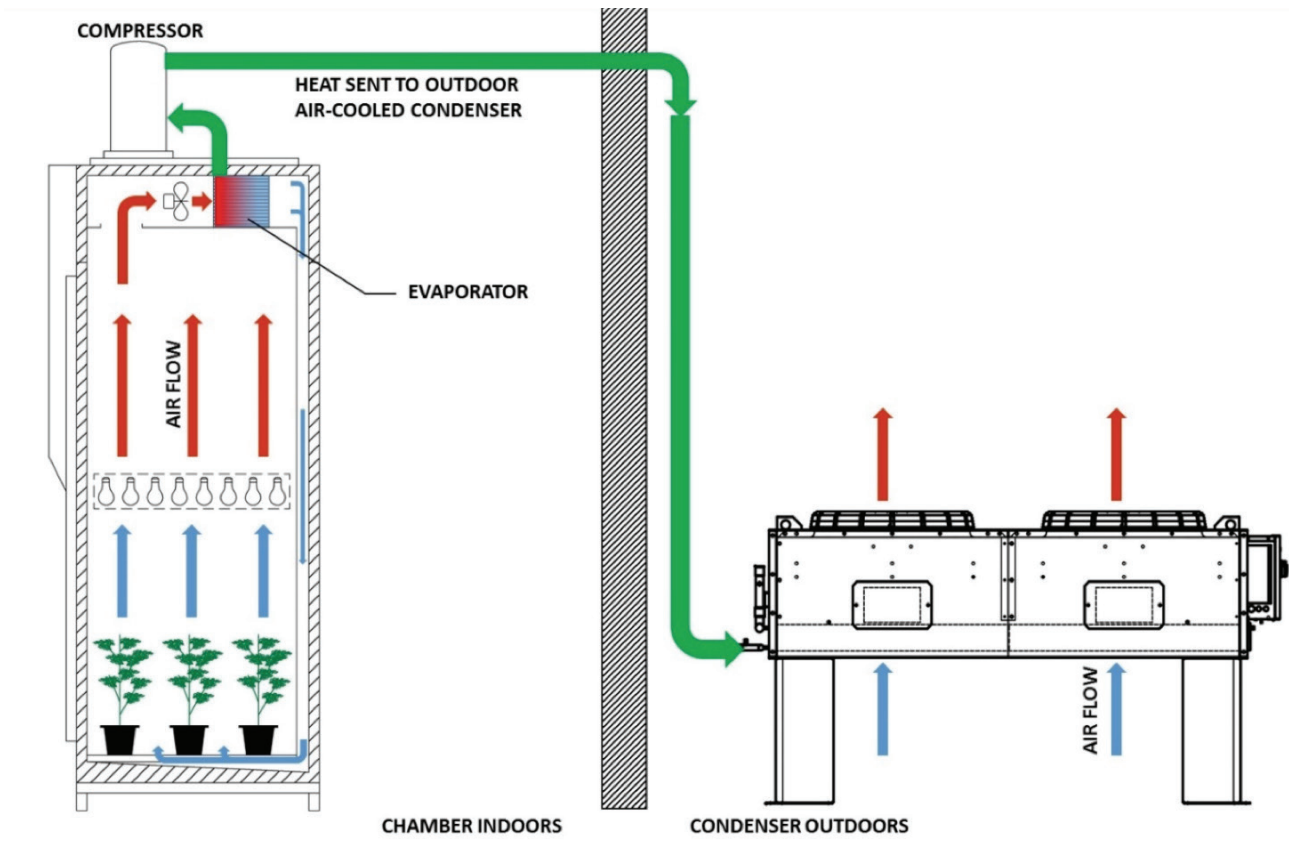
Benefits

- No cooling water supply is needed.

Drawbacks

- Condenser must have a suitable location available for installation.
- Additional refrigeration and electrical work must be done to connect the condenser to the plant growth chamber and provide it with power.

Figure 3 - Remote air-cooled chamber



Remote Air-Cooled Condensing Unit (RACCU)

In some laboratories it is critical to keep the sound level as low as possible. There is one more condenser option which takes the two loudest components on the chamber, the condenser fan(s) and the compressor, and locates them both outdoors. The resulting piece of equipment placed outdoors is called an air-cooled condensing unit. This condensing unit combines a remote air-cooled condenser (RACC) with an enclosed compartment to house the compressor and controls. Installation is very similar to the RACC option, but some additional piping and control cabling are required.

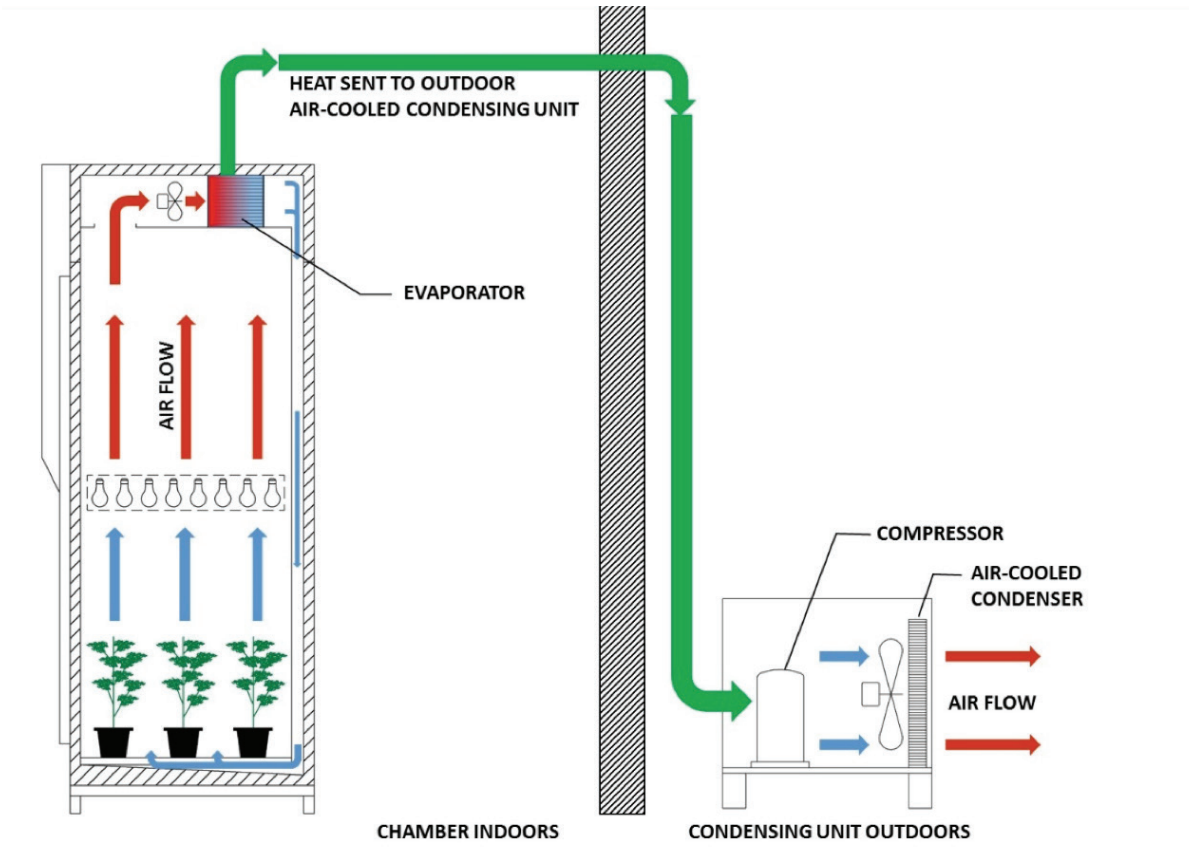
Benefits

- Noise from the chamber is reduced.
- No cooling water supply is needed.

Drawbacks

- Condensing unit must have a suitable location available for installation.
- Additional refrigeration and electrical work must be done to connect the condenser to the plant growth chamber and provide it with power.

Figure 3 - Remote air-cooled chamber



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